energy
energy
energy

KOZLODUY NPP Plc.

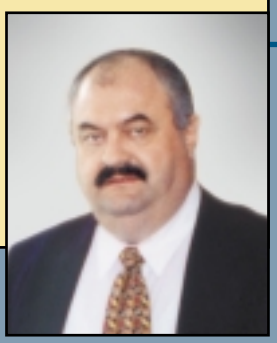
nuclear power plant

2000 ANNUAL REPORT

Structure of Kozloduy NPP Plc.

Management

Executive Director of Kozloduy NPP Plc.



Jordan Jordanov

Safety and Quality Division

Nikolay Todorov

Production Division

Yonko Gledachev
Deputy Executive Director

Economics and Finances Division

Tencho Popov

Reconstruction and Modernization Division

Sabin Sabinov

DEAR COLLEAGUES,

Kozloduy NPP Plc. entered the Third Millennium achieving a specific record in its 26 year history - the plant recorded the highest ever nuclear electricity generation.

The installations of Kozloduy NPP Plc. produced 18 178 342 000 KWth electricity over the year 2000 in strict compliance with all safety requirements. This high generation result is an indicator of the increasing importance of the nuclear plant in the country economic development.

In April 2000 Kozloduy NPP was separated from the National Electric Company as a 100% state owned public limited company. The company was registered in accordance with the National Trade Law.

Kozloduy NPP Plc. separation allows operational independence in making managerial decisions relating to the production process and in defining the company financial and economic policy.

The implemented new organizational structure has brought about optimization of the interrelations and coordination between the separate organizational units and clearer definition of the authority and obligations of their managers.

A strategic objective of high importance to Kozloduy NPP Plc. is the continuous safety upgrading. The nuclear plant management strives to meet the constantly developing international standards for nuclear installations by implementing reconstruction and modernization measures and by enhancing the safety culture.

During the outage of Units I-IV were implemented all planned modernization measures as well as refueling of these units.

The safety upgrading activities intended for Units 3 and 4 were separated in an independent package of measures, based on the Complex Modernization Program PRG'97/A.

The major measures which are characteristic of the next modernization stage have already started, namely: installation of a jet vortex condenser, development of a rest life time management program, revision of the reactor mode tables etc.

In 2000 the nuclear plant management officially declared before international expert organizations the implementation of a project intended to bring Units III and IV into a new reactor model, different from the basic 230 model. The implementation of this strategy is aimed at justifying the acceptable operation of the 440 MWh reactors of Units 3 and 4 with no limitations.

At the same time Kozloduy NPP Plc. has been preparing decommissioning of Units 1 and 2 by the end of 2002 in accordance with a memorandum between the Bulgarian government and the European Union signed in November 1999.

Last year ended the preparation phase, whose purpose was to develop the projects for the extensive reconstruction and modernization program for Units 5 and 6. The conditions were updated and contracts with the European Consortium Kozloduy and with Westinghouse were signed. In order to ensure the required financing loan agreements were signed with City bank USA, Euratom and Roseximbank. The overall financing of the project is complemented with plant own funds.

The plant management team strives to ensure maximum transparency and accessibility to nuclear plant related information. All activities are performed in compliance with the international standards and are agreed upon by the Regulatory body - the Committee on the Use of Atomic Energy for Peaceful Purposes and other specialized regulating authorities. A strict procedure for state and international institution notification has been developed and followed.

A sociological survey held in the spring of 2000 showed that Kozloduy NPP Plc. enjoys a broad public confidence. According to the obtained results 67.3% of the Bulgarians approve of the use of nuclear energy for electricity generation.

The Bulgarian public perceives the nuclear plant operating in compliance with the world standards as a source of self-confidence resulting from the fact that even nowadays atomic energy use for peaceful purposes remains one of the most modern world technologies.

We should not forget the two big nuclear accidents - Three Mile Island /1979/ and Chernobyl NPP /1986/, which stroke a hard blow on the development of the nuclear energy industry. The lesson learnt from these accidents is that safety must be paid careful attention and given the highest priority. In this regard the new designs of future nuclear plants count on the passive safety systems and localization systems, protecting the public and personnel from the harmful impact of nuclear radiation under normal and emergency conditions of operation.

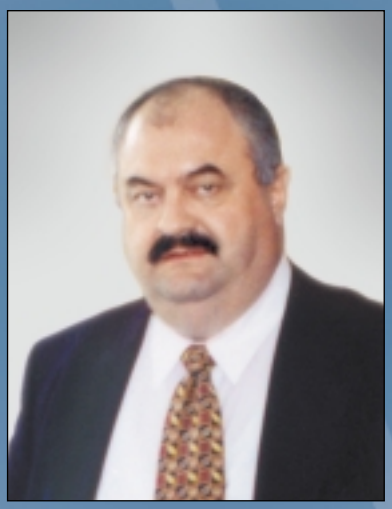
I am convinced that the use of nuclear energy for electricity generation has no alternative in the starting century and it has a promising future if the efforts aimed at ensuring safe operation of the nuclear installations and solving the issues related to the global warming and pollution of the Earth never stop.

Iordan Iordanov
Kozloduy NPP Plc.
Executive Manager

Board of Directors

Anton Ivanov
Chairman of the Board of Directors of Kozloduy NPP Plc.

Ivan Hinovski
Deputy-Chairman of the Board of Directors



Jordan Jordanov
Executive Director of Kozloduy NPP Plc.

Ekaterina Stefanova
Member of the Board of Directors

Yonko Gledachev
Deputy Executive Director

Safety and Quality

The main objective of Kozloduy NPP Plc. is electricity generation in strict compliance with nuclear safety and radiation protection requirements.

These requirements are defined in the "Law of Use of Atomic Energy for Peaceful Purposes" (LUAEPP), regulatory documents for application of LUAEPP, technical specifications for safe operation of the reactors, instructions for operation of systems and equipment. Some of the requirements have been implemented following the recommendations of the International Atomic Energy Agency (IAEA) missions, the World Association of Nuclear Operators (WANO) and the international experience in the nuclear field.

The "Law of Use of Atomic Energy for Peaceful Purposes" (LUAEPP) and the document "Safety policy of Kozloduy NPP Plc." define compliance with safety requirements as a high priority task.

All operational events at Kozloduy NPP Plc. are recorded, analyzed and reported to the Inspectorate of Safe Use of Atomic Energy in compliance with the Bulgarian legislation and internal normative and technical documents.

The number of recorded events in 2000 and their levels, evaluated under the international INES scale, are an indicator of the plant nuclear and radiational safety during the period.

Distribution of events in 2000 by scale levels and by units at Kozloduy NPP:

Unit /INES level	I	II	III	IV	V	VI	All-station events	Total
„1“	0	0	1	2	0	0	0	3
„0“	4	11	10	12	10	8	1	56
Total number of events	8	14	16	20	12	12	2	84

Fifty-six events were assessed as "0" level, below the INES scale, since they were related to safety but did not result in its impairment.

Three events in 2000 were assessed as level "1" and they brought about deterioration of the in-depth defense. The total number of safety related events in 2000 under the INES scale was 59, which represents 86.82% of the total number of reported events.

The total number of reactor scrams at Kozloduy NPP in 2000 is comparable to the world standards for this type of reactors and is characteristic of their high operational reliability.

The values of this parameter for Units V and VI are among the best in the world which proves that their level of safety and reliability complies with the international criteria.

There were no events in 2000 leading to environmental or plant site radiation contamination.

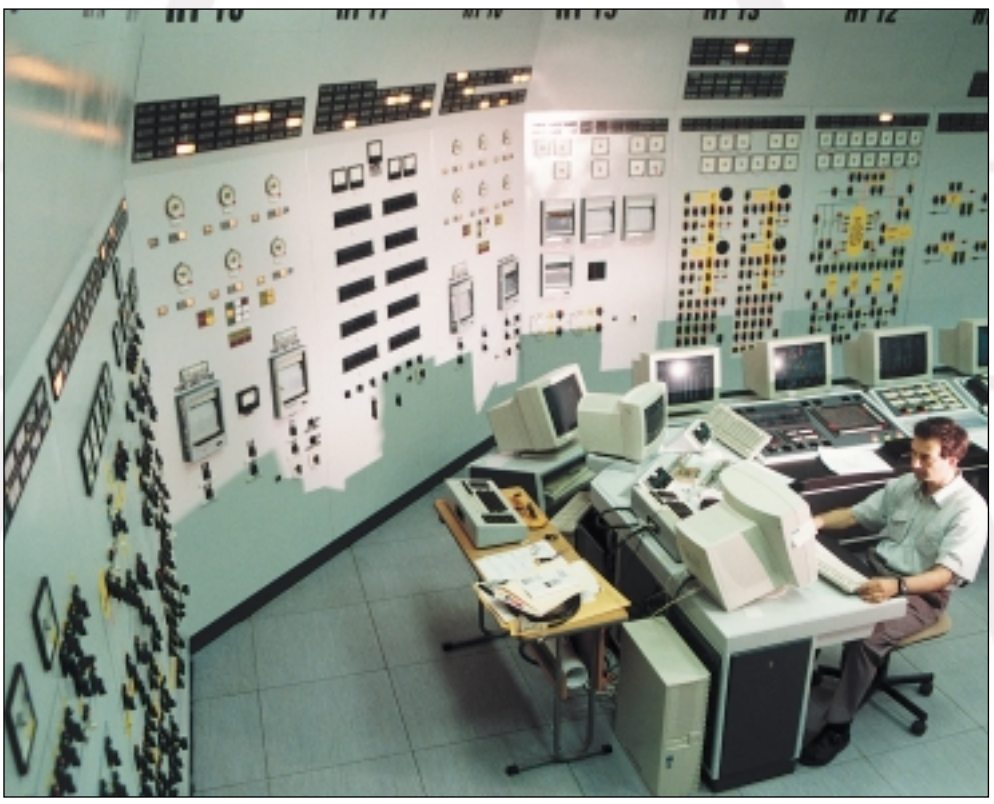
The relative share of safety related events compared to the total number is nearly constant and is about 60%.

In 2000 there was a considerable reduction of the number of events caused by instruction inaccuracy or human errors and that gives evidence this safety culture of Kozloduy NPP personnel has improved compared to 1998 and 1999.

The number of reported events at the plant in 2000 has increased. The explanation for this is that the plant management established more stringent criteria for event recording and analysis. Over the past years Kozloduy NPP Plc. management has become more exigent as regards operational events reporting which resulted in the higher value of the reporting factor - 92.5% in 1999, 100% - in 2000.

In order to respond to the high media and public sensitivity to Kozloduy NPP Plc. the plant reported last year additional 16 non-safety related events, which are not covered by the regulation criteria (this was done by daily reports and information exchange between Kozloduy NPP Plc. and the Regulatory body).

The operation of the plant in 2000 put Units V and VI of Kozloduy NPP Plc. among the world most reliable units. Unit V reached 6 years of operation without reactor scram actuation on 7 April 2000 and Unit VI reached 4 years of operation without reactor scram actuation on 22 December 2000. According to the WANO criteria one reactor scram actuation in two years is an indicator of high operational reliability.



The long years of operation of VVER-440 and VVER-1000 reactors show their high reliability and prove that their safety level is fully acceptable according to the international criteria.

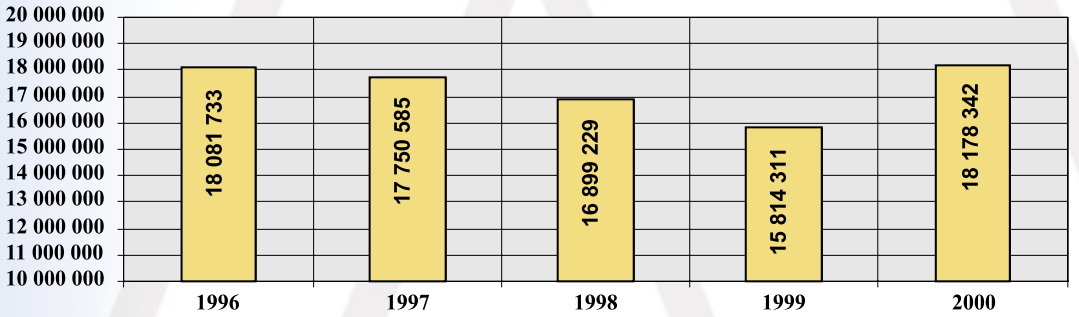
All these data reveal full openness of the Kozloduy NPP Plc. management in notifying the Regulatory body and public of events and confirm the fact that even non-safety related events have been reported.

Electricity Generation

In 2000 Kozloduy NPP Plc. produced a record high quantity of 18 178 342 000 KWh electricity in full compliance with safety requirements. The planned annual production figure showed 17 769 960 MWh.

Compared to 1999 there is an increase of 15%.

Kozloduy NPP electricity generation in the last years [in MWh]:

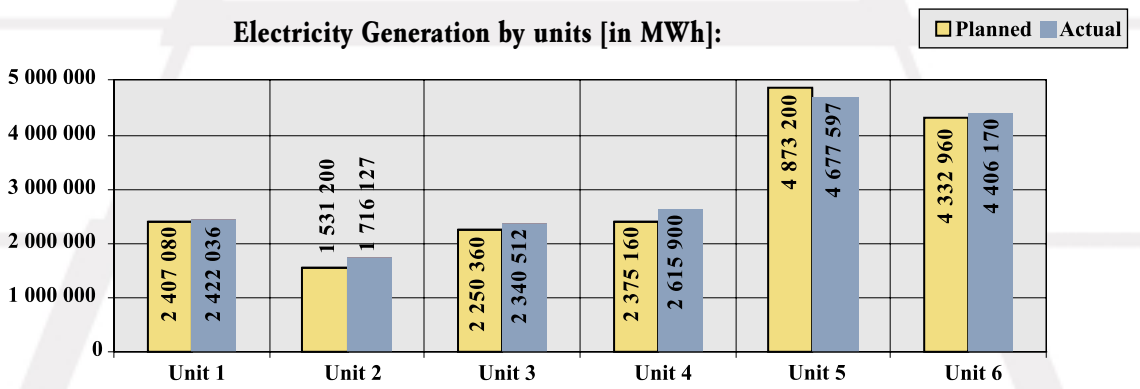


The gross generation program of the plant for 2000 was fulfilled by 102.3% and the net program by 101.25%.

The tendency towards decreasing (with 5-6% per year) plant electricity production, which had started in 1996, not only stopped in 2000 but the generation hit a record in the plant history.

The generation of Units I-IV increased compared to 1999 by 21.5% and for the first time it outstripped Units V and VI.

Electricity Generation by units [in MWh]:



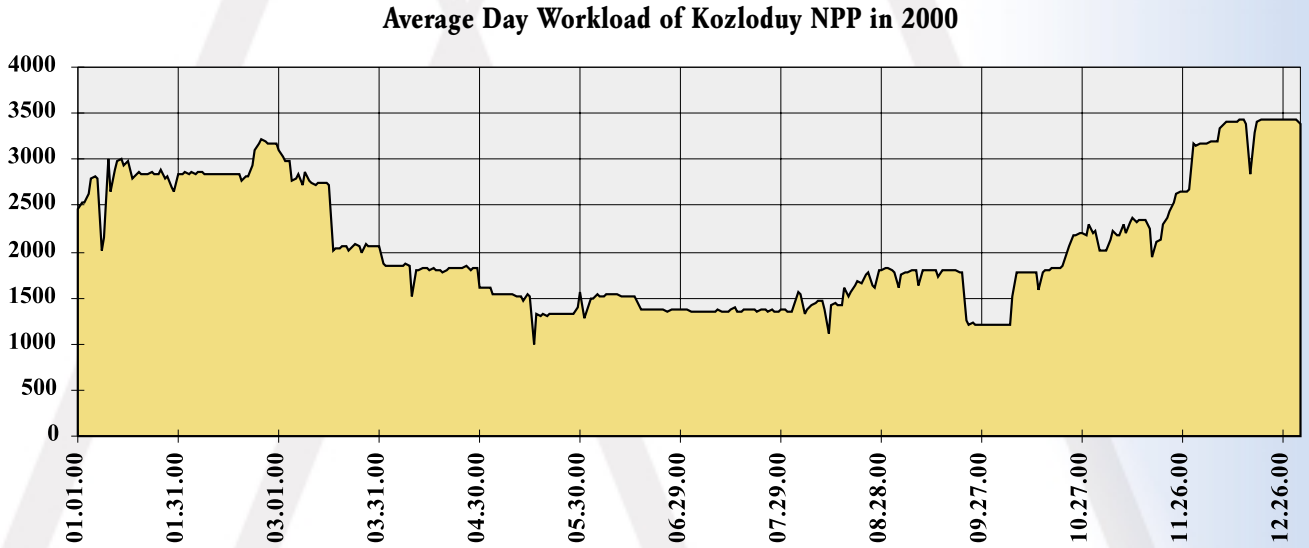
The generation of Units V and VI also increased compared to 1999 by 9.1%.

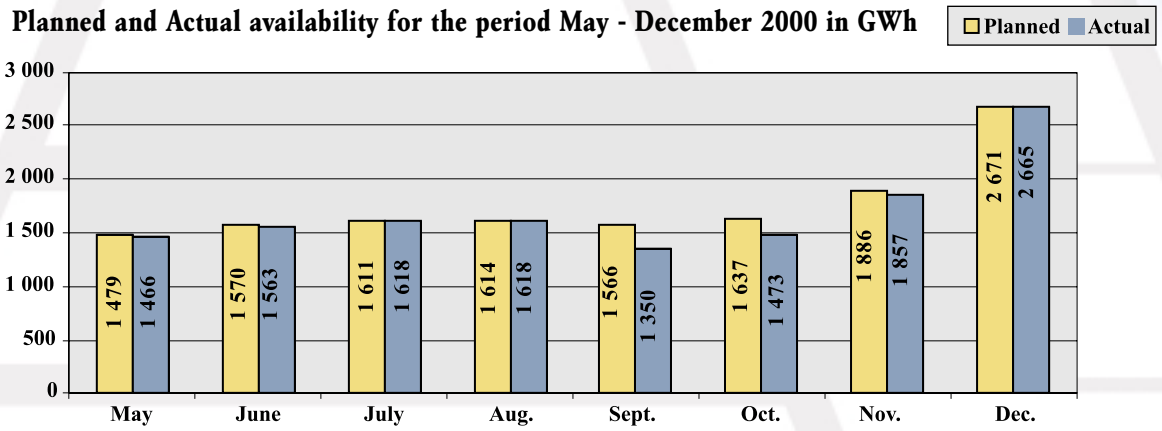
The generation keeps its seasonal character - it begins with a drop already in the middle of March, the tendency continues by the end of April and May and then fixes a stable summer load of about 1400 MW.

The average workload of the units was considerably above the level in 1999 except for Unit III.

The main indicator for the use of installed capacity throughout the year is the average hour output of the plant. This factor for 2000 is 2 069 MW and represents 54,9% of the installed capacities, compared to 1 805 MW for 1999.

The average annual work load for the time in operation is 2 986 MW.

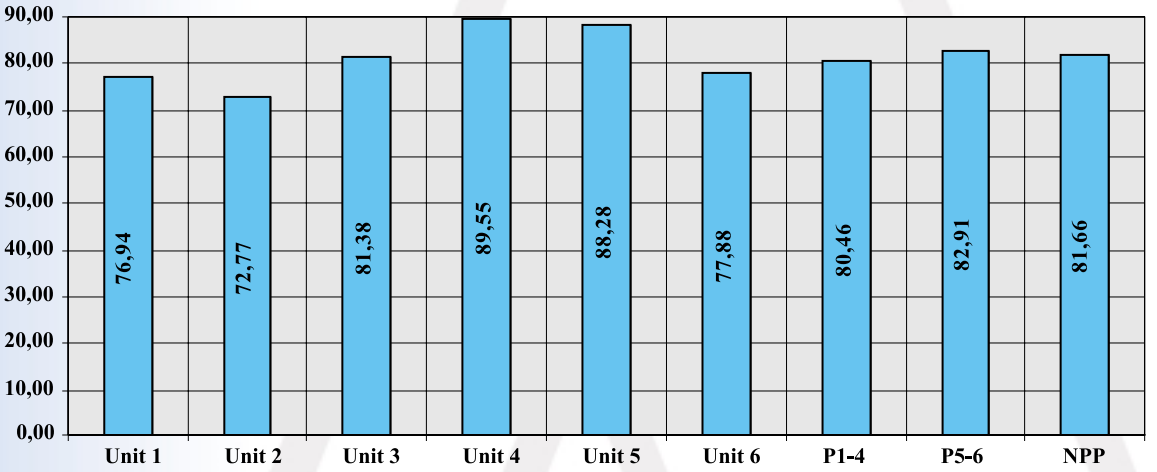




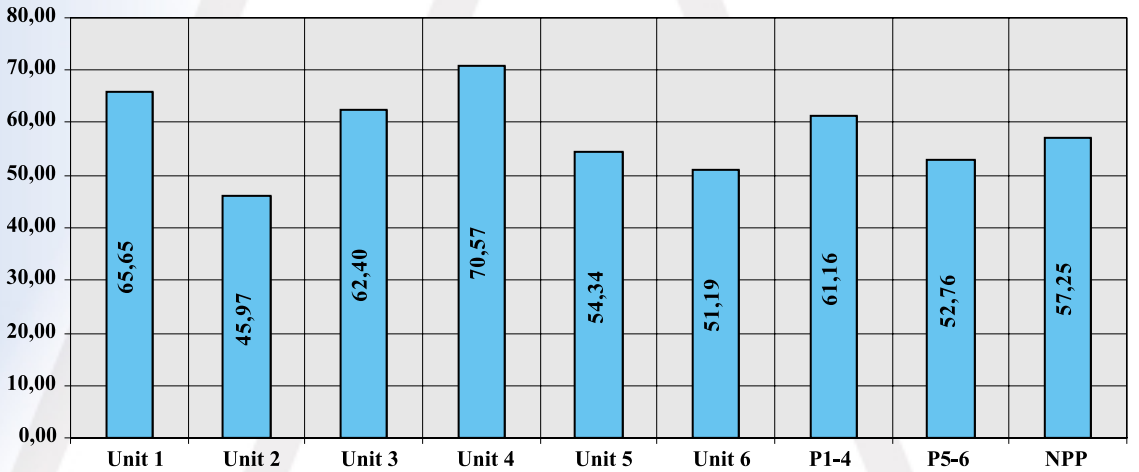
After its separation from NEC as a public limited company Kozloduy NPP signed a contract for sale of active electricity and provision of available power to NEC for the period May-December 2000. The contract was fulfilled at 103% in terms of net sale of active electricity.

In terms of provision of maximum available power the obligations were fulfilled 96.92% for the duration of the contract.

CFop in % of the separate units, production divisions and the plant as a whole in 2000

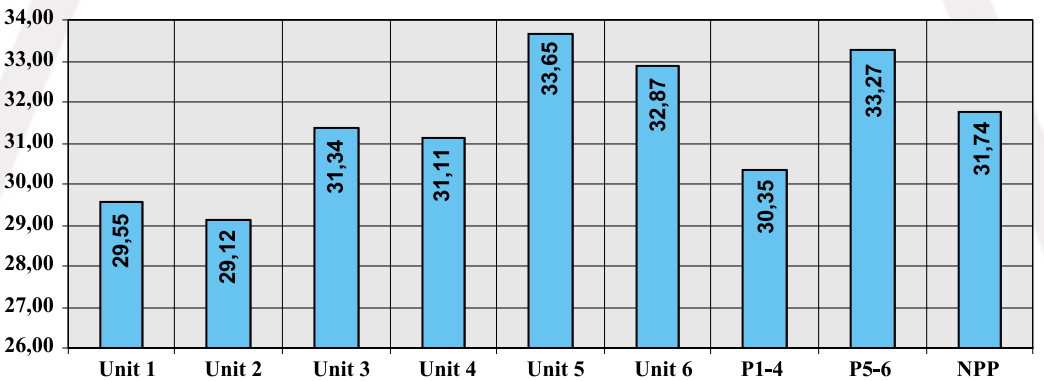


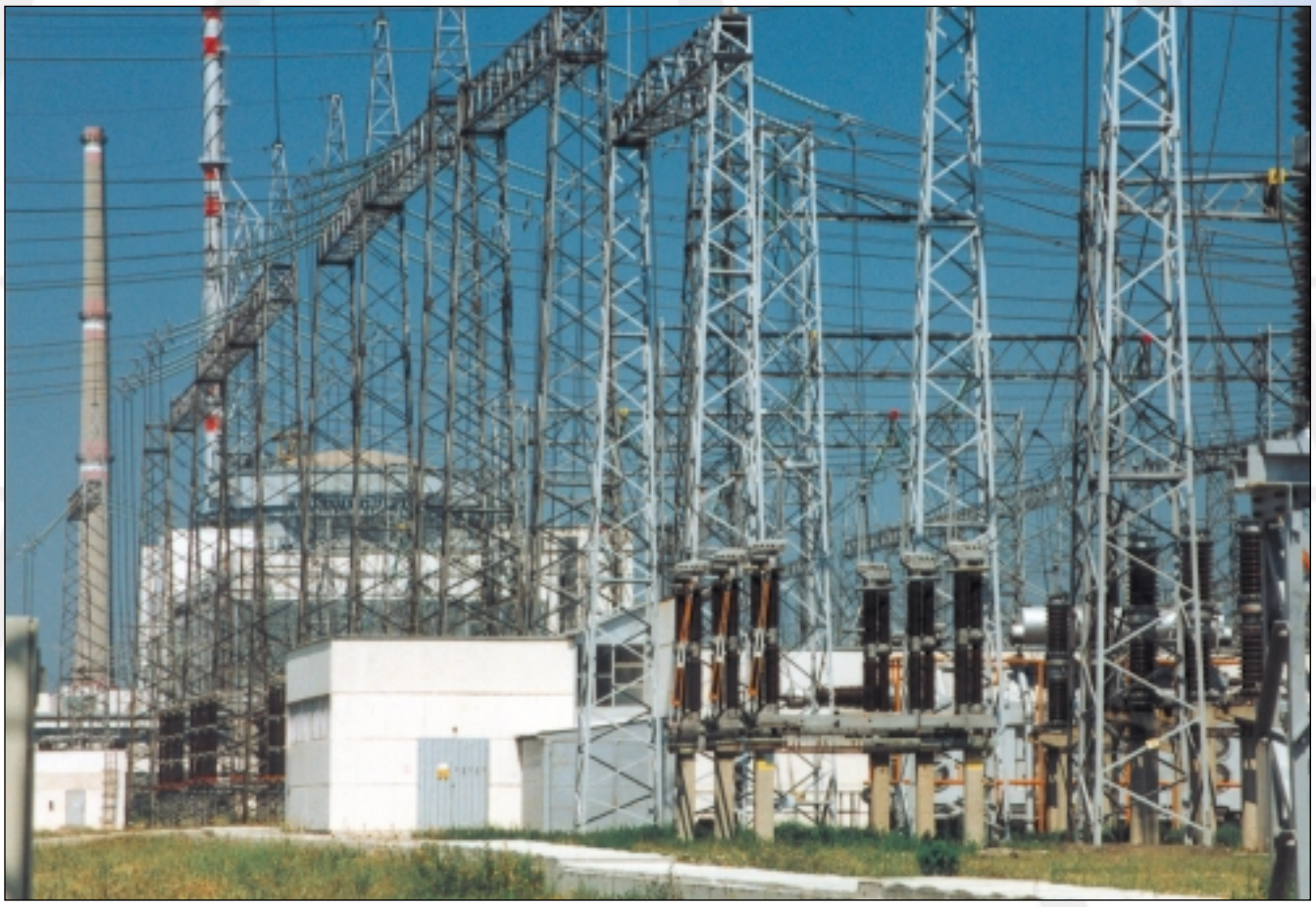
CF in % of the separate units, production divisions and the plant as a whole in 2000



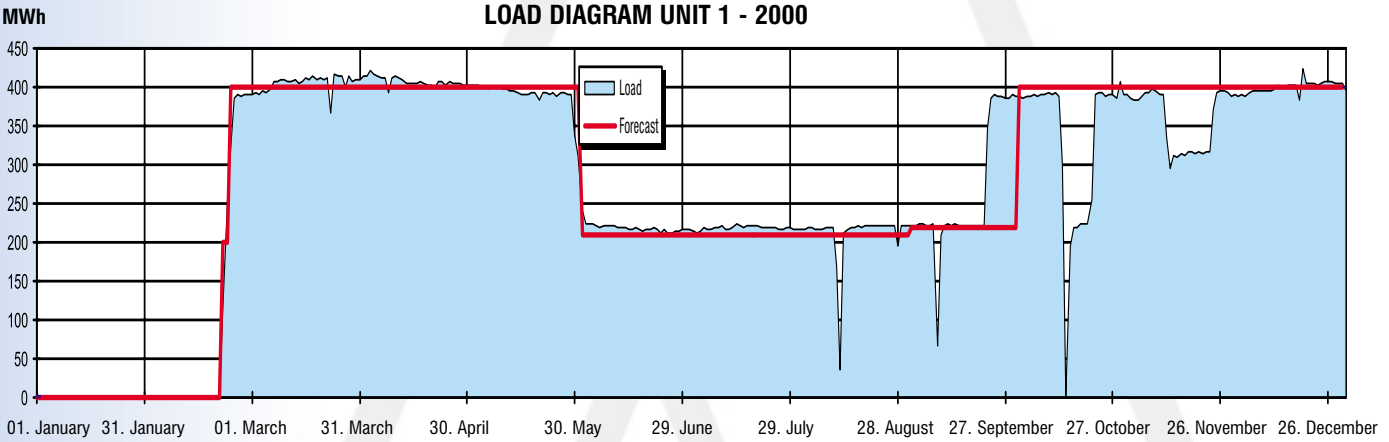
CF	Capacity Factor
CFop	Capacity Factor during Operation
GCF	Gross Efficiency Factor
P 1-4	Production division Units 1 - 4
P 5-6	Production division Units 5 - 6

GEF in % of the separate units, production divisions and the plant as a whole in 2000

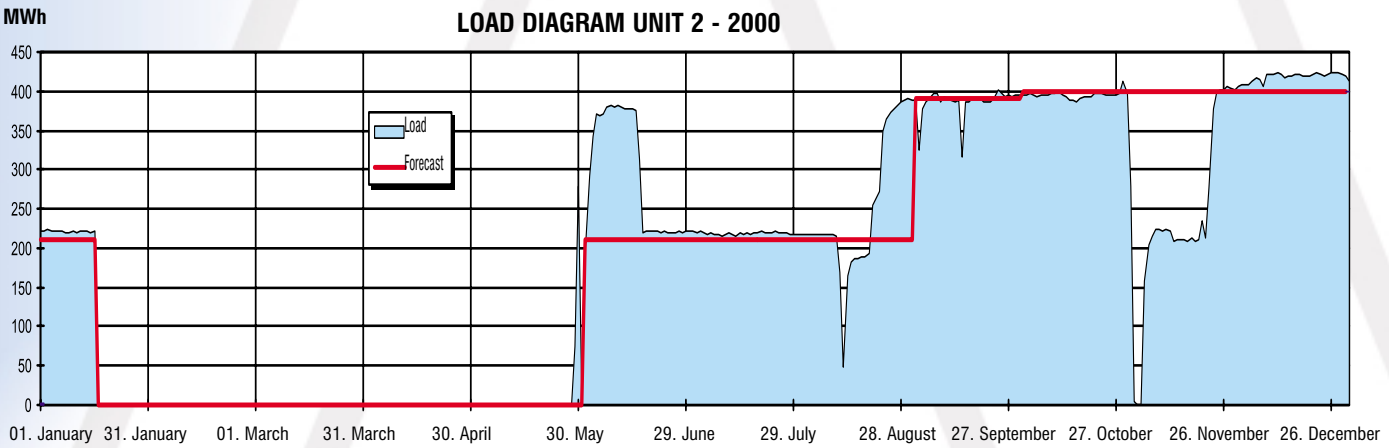




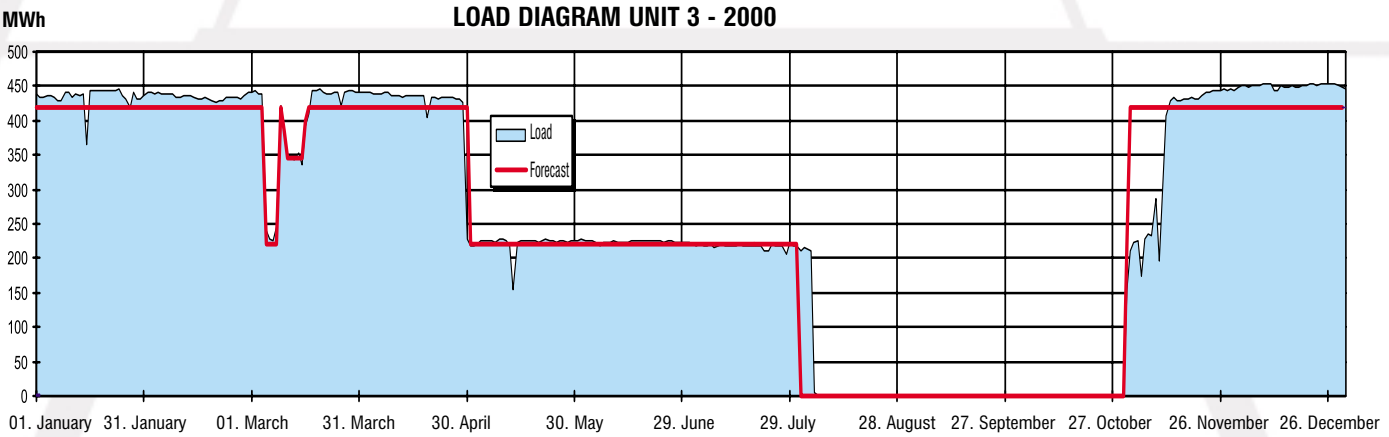
LOAD DIAGRAM UNIT 1 - 2000



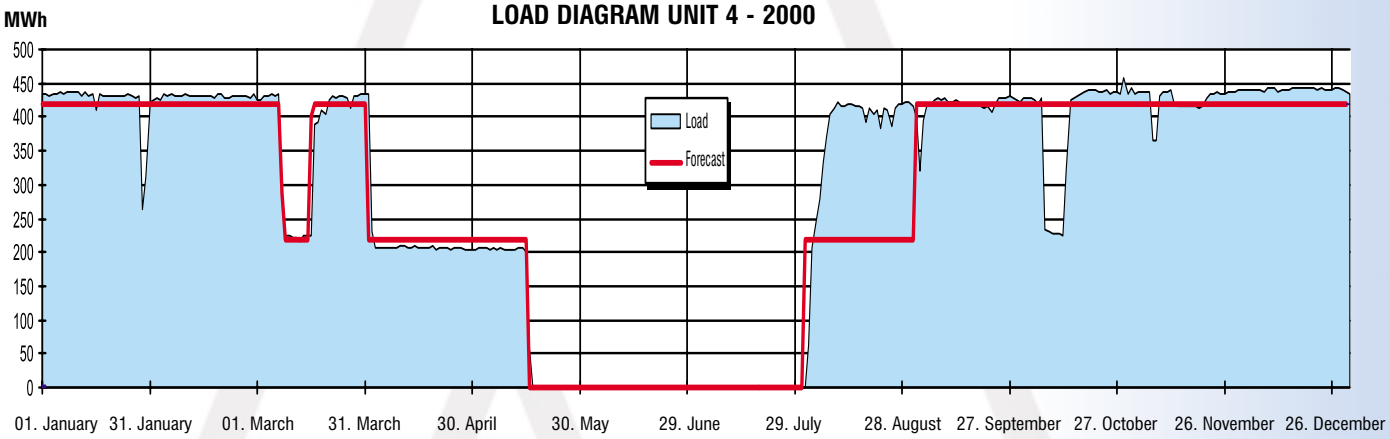
LOAD DIAGRAM UNIT 2 - 2000



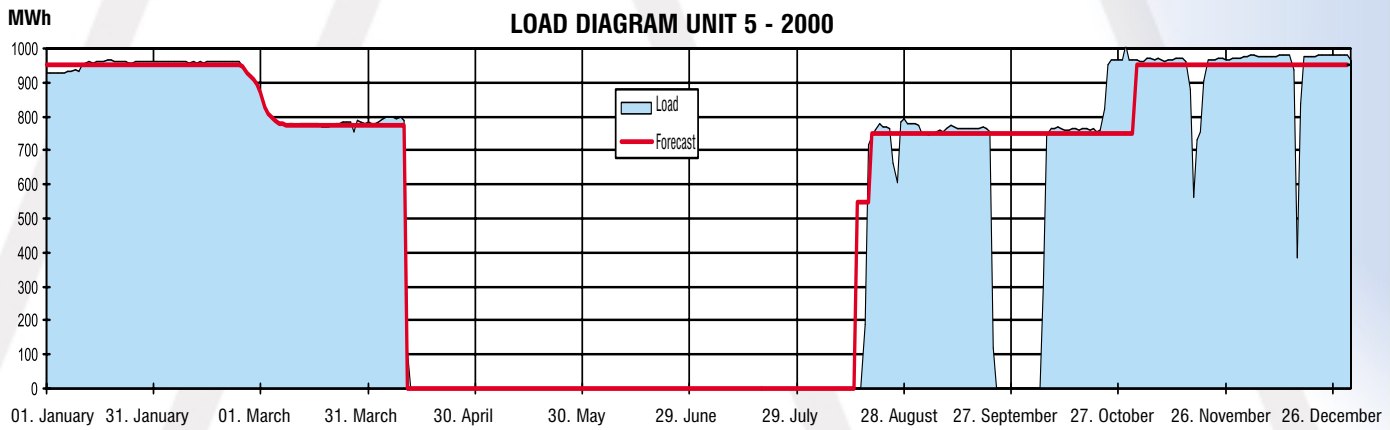
LOAD DIAGRAM UNIT 3 - 2000



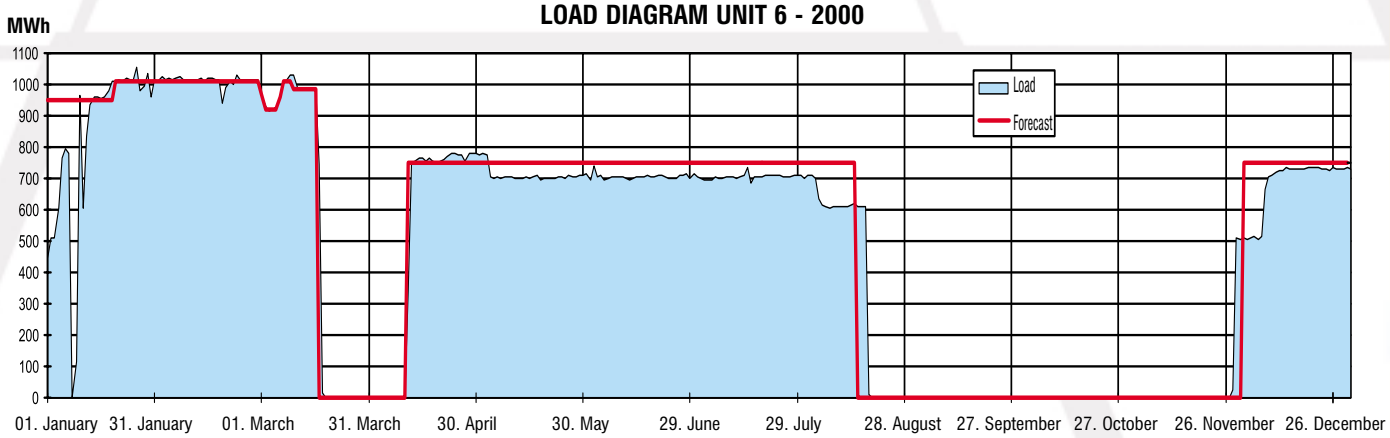
LOAD DIAGRAM UNIT 4 - 2000



LOAD DIAGRAM UNIT 5 - 2000



LOAD DIAGRAM UNIT 6 - 2000



Financial and economic results

The first eight months of the existence of Kozloduy NPP Plc. as a public limited company have revealed the viability of the company and the correctness of the decision for separation.

During the period of May-December 2000 were produced 10 969 331 thousand KWh electricity which exceeds the plans with 4% as well as 35 193 Gcalories thermal energy.

The total company costs amount to 336 377 000 leva. 335 630 000 leva were spent for electricity generation. Generation cost shows reduction of 23.67% compared to the planned cost which is explained by regulation modifications, reduction of costs for maintenance and maintenance related equipment and materials, as well as for spent fuel transport since the fuel was not transported in 2000.

The biggest relative share in the structure of the constant generation costs is given to the remuneration costs- 25.05% and deprecation costs - 21.95%. The work salary for the period May-December 2000 shows a rise of 16.54% compared to the figure in the company business plan.

Human factor is of paramount importance for the normal operation of Kozloduy NPP. The plant personnel consists of 6 680 people and the average gross monthly salary is 660 leva.

In general the electricity generation costs in the above mentioned period have been reduced compared to the forecasts in the Business plan as a result of reduction of some price formation factors which reflects in the production cost of electricity. The reported reduction is 27%.

10 057 239 thousand KWh energy were sold as well as 13 601 911 thousand KWh available reactor power which brought an income of 371 141 000 leva to the company.

560 000 leva is the income from sale of thermal energy.

The total income for the period from May to December 2000 is 436 803 000 leva.

The gross profit is 100 426 000 leva. The net gain after taxes deduction is 64 034 000 leva. It was used to fund the modernization and reconstruction measures on the units and other investment activities.

During the period the company has transferred 25 182 000 leva to the "Nuclear Installations Decommissioning" fund and 9 443 000 leva to the "Safe Storage of Radioactive Wastes" fund. 36 392 000 leva were paid as taxes in the national budget. In addition 18 927 000 leva were paid in social funds, including 15 316 000 leva as income tax, 942 000 leva paid in the Requalification and Unemployment Fund, 1 453 000 leva in the Health Insurance Fund and 1 216 000 leva in the Voluntary Pension Insurance.

Kozloduy NPP Plc. current financial state is reached as a result of the efficient management directed at maximizing the income and optimizing the costs by:

- Ensuring strict control of the production parameters under the contract for sale of electricity;
- Eliminating the unjustified cost, such as:

- Closing down businesses which are not related to nuclear power production e.g. sausage workshop, slaughter house, pig-breeding farm, greenhouse, "First Atomic" sweetshop;

- Restructuring of Atomenergoremont and Atomenergostroyprogress enterprises, Transport department, Thermal power station, Canteen Catering and Hygiene departments and many other extrinsic activities;

- Optimizing the number of employees on the payroll ;

- Control over goods and services orders;

- Strict compliance with the Public Procurement Law in terms of selection of contractors or suppliers.

The results are indicative that Kozloduy NPP Plc. is a profitable enterprise, capable of financing its own development and allocating sufficient resources for the safe operation of the reactors.

Radiation protection

Optimum radiation protection of Kozloduy NPP Plc. personnel and the public is one of the principles of the safe plant operation. The basic parameters are the individual and collective personnel doses and the gaseous and liquid radioactive releases which define the potential impact of Kozloduy NPP on the public.

The collective effective dose for the personnel of Kozloduy NPP Plc. and external companies and organizations in 2000 was 6.1 man.Sv. (5.05 man.Sv for Units I-IV and 1.05 man.Sv for Units V-VI). Compared to 1999, one more outage took place on Units I-IV in the year 2000, as well as some additional reconstruction works in the Radiation Monitoring area, which accounts for the higher collective dose value last year. The collective plant dose is 26% lower than the planned dose budget (8.2 man.Sv). The external organizations personnel received 1.58 man.Sv during their work inside the plant which represents 25.9% of the overall dose.

The annual mean value of the individual effective dose is 1.46 mSv.

The overall annual collective dose for 2000 normalized to the number of reactors in operation at Kozloduy NPP Plc. is 1.016 man.Sv/ (1.26 and 0.52 for Units I-IV and V-VI respectively. WANO data for 1997, 1998 and 1999 show mean value of 1.13 man.Sv/.

The number of persons who have received more than 20 mSv annual individual dose is 21 compared to 73 in 1998 and 11 in 1999. Three of them are plant employees and the recorded difference over 20 mSv is < 2,5 mSv (10% of the administrative dose limit for Kozloduy NPP Plc).

The tendency towards reduction of the collective dose in the recent years has been maintained.

The low levels of these parameters, comparable with the average European values for this type of reactors show that our success has not been gained by chance and that Kozloduy NPP Plc. has been systematically applying the ALARA principle.

Radiation monitoring of environment

Radiation monitoring of the environment is aimed at limiting the harmful effects of the ionizing radiation on the personnel, public and environment within the established norms.

The long-term program of Kozloduy NPP Plc. for environment radiation monitoring was agreed upon by the supervisory and regulatory bodies - CUAEPP, Ministry of Environment and Waters, Ministry of Health. It meets the IAEA requirements, the national "Basic norms for radiation protection (ONRZ-2000)", and other countries good practices in that area.

For the purposes of radiation monitoring three zones of different radius have been established around the plant: sanitary-protected area /3 km/, controlled area /12 km/, monitoring area /100 km/. The plant performs laboratory and automatic monitoring of the environmental parameters.

Thirty-six control points are situated within the monitoring area where are performed measurements and sampling for laboratory analysis of the content of natural and technogenic radionuclides. These control points provide samples of air, soil and vegetation for analyses and measurement of the gamma background. The analyses study water, milk, meat, fish and other samples from other locations. Special attention is paid to the monitoring of Danube river and potable water sources.

The automated environmental radiation monitoring in incident and emergency cases is performed by the ten measuring stations of the automated "Berthold" information system for external radiation monitoring. The system has three automatic meteorological stations ensuring the meteorological monitoring.

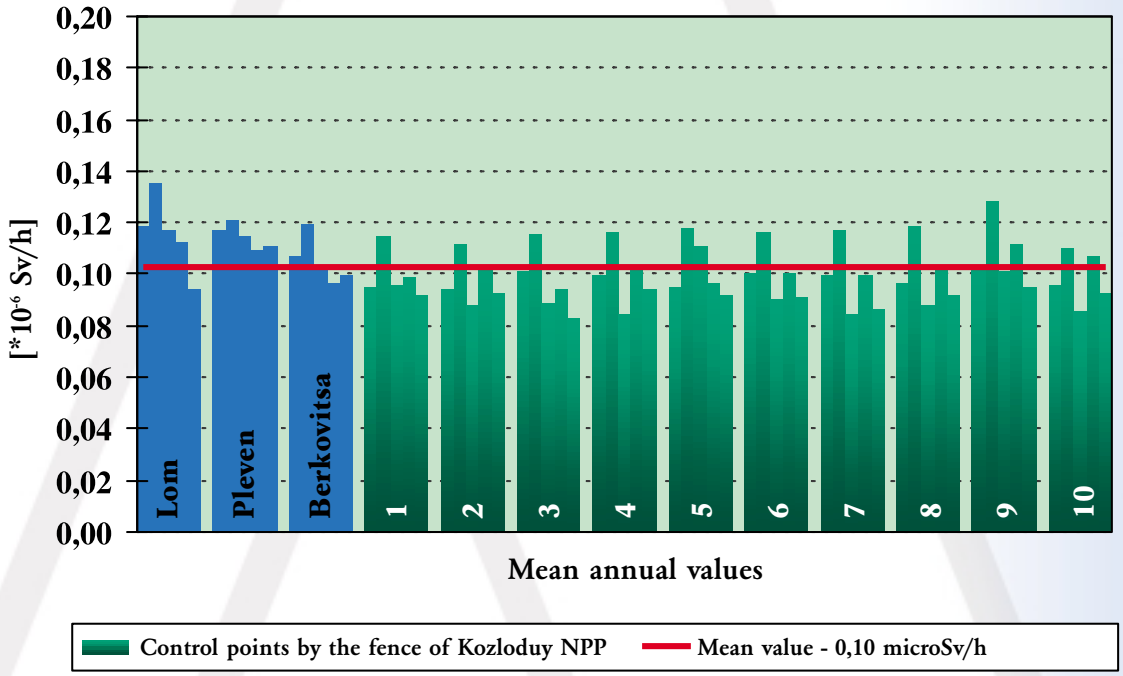
The radiation monitoring system of Kozloduy NPP is integrated with the analogous national system of the Ministry of Environment and Waters. There goes information exchange in both directions. In order to make the data of the continuous radiation monitoring public the plant has built a special information center and a dispatch center at the Environment Monitoring department of the plant. The data on the gamma background at the site of Kozloduy NPP and in Northwestern Bulgaria is visualized on-line there. The integration of automatic radiation monitoring systems into a unified national system is a strategy to maintain the public trust in the safe operation of Kozloduy NPP.

About 2000 samples from various locations within the 100-km area of monitoring around Kozloduy NPP are analyzed annually. Basic analysis methods are gamma spectrometry, low background radiometry of the overall beta activity and liquid scintillation spectrometry.

The radiation gamma background within the sanitary protected area and the 30-km area of monitoring has values, which are typical of the natural background in the region. The obtained results are within the range of 0.07-0.15 μSv/h and indicate that there is no difference between the dose rates measured by the fence of the industrial site and the ones measured in the towns of the region.

GAMMA BACKGROUND DOSE RATE BY THE FENCE OF KOZLODUY NPP AND IN THE TOWNS WITHIN THE 100-KM AREA, 1996-200

(Thermo luminescent dosemeters)



The results of analysis of the basic environment components such as air, water, soil and vegetation, as well as the foodstaff typical of the Kozloduy NPP region are within the normal limits for these latitudes. The measured concentrations are times lower then the regulated norms and are fully comparable to the data of previous years and the pre-start up period.

The radiation parameters of the Danube water in the year 2000 showed values, typical of rivers. The results measured up and down the stream in the Kozloduy NPP area are comparable and they show no radiation contamination. The overall beta activity results in 2000 fall into the limits of < 0.031 to 0.34 Bq/l, the tritium content was < 6.9 Bq/l.

The results of the atmospheric air radioactivity are inherent to the global atmosphere pollution. The radiocesium concentrations measured are extremely low: 1 to 10 μBq/m^3. These are results characteristic of the air near the ground at these latitudes.

The soil radioactivity is analyzed in all 36 control points. Results are similar to the ones obtained during previous years. At that a trend is developing of soil self cleaning after the nuclear tests and the Chernobyl accident. The ^{137}Cs content in the analyzed soil samples varies from 2.94 to 75.7 Bq/kg, the mean value for 2000 being 24 Bq/kg.

Analyses of the basic food staff produced in the Kozloduy NPP area, such as milk, meat, fish, agricultural products show values within the normal limits. So far the results show no evidence of the influence of Kozloduy NPP operation.

The radioactivity released by the nuclear plant with the gaseous and liquid emissions is within the limits of up to 1% of the design norms.

The low emission rates account for the extremely low public dose rate, which cannot be practically measured but is estimated through model mathematical calculations.

The maximum value of the annual individual exposure in the 30-km area resulting from gaseous emissions from Kozloduy NPP for 1998-2000 is within the range of 2,9.10^{-7} to 3,5.10^{-7} Sv/a. This radiation is less than 0.015% of the background radiation typical of the region of Kozloduy NPP and is less than 0.1% of the norm of 1 mSv regulated for the public in accordance with ONRZ-92 and 2000.

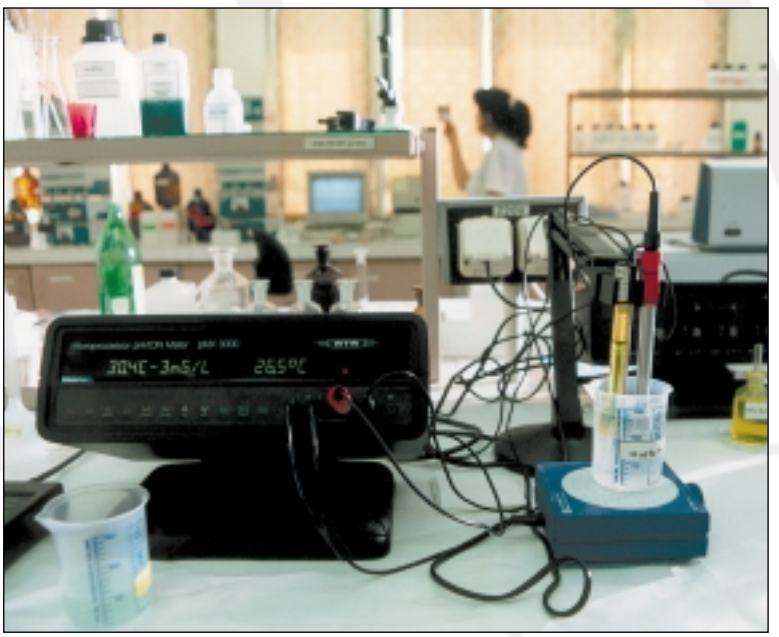
The maximum annual collective public exposure in the 30-km area is estimated to be within the limits of $2{,}97.10^{-3}$ to $3{,}58.10^{-3}$ manSv/GW.a. The values are fully comparable to the data of 1998 for a large number of PWR plants.

The individual public exposure resulting from the liquid emissions is between $1{,}2.10^{-11}$ and $2{,}2.10^{-11}$ Sv/a, which is negligibly low.

The data obtained in 1998-2000 on dose exposure of the public in the 30-km area of Kozloduy NPP are fully comparable to the data obtained during previous years and confirm the conclusions that the influence on the environment and public is negligibly low.

Conclusions:

- The radiation monitoring in 2000 and the previous years shows compliance of the actual environment situation with the current Bulgarian legislation;
- Comparison of recent data with last years data and data before the plant start up shows no tendency towards changes in the radiation status of environment;
- Radiation situation within the 100 km area of monitoring around Kozloduy NPP is completely favorable.



Electricity produced by the national nuclear industry in 2000 is 18.2 billion KWh and it has saved more than 27 million tons of CO_2, 1.2 million tons of SO_2, 77 000 tons of NO_x and 51 000 tons of dust, containing natural radioactivity. This nature friendly effect is in line with the world tendencies towards reduction of ozone destroying substances release into the atmosphere.

Physical protection

The main components of the physical protection system of Kozloduy NPP Plc. are: the physical guard under the responsibility of a specialized police department, technical security systems operated by the Security Department and organizational measures on the access control implemented by the protection personnel. This system was developed in accordance with the requirements of the International Atomic Energy Agency, reflected in the INFCIRC/225 document.

After Kozloduy NPP Plc. was set up as a public limited company a program for physical protection upgrading was developed and approved.

The physical protection of the Controlled Area and the restricted access area is carried out by the "Police" section of the Kozloduy Police department. The "Technical Security Systems" department maintains and operates the automated pass access control system, the perimeter signal protection systems on the boundaries of the controlled zone, the service water supply channels, the signalization protection systems of the sites outside the protected area, technologically related to electricity production, the automatic system for protection of technological premises and installations in the radiation monitoring area, premises with ionizing radiation sources and other locations, a TV system for monitoring and control in the Radiation monitoring area-1, main plant entrances and other locations inside.

On 28 November 2000 a new modern building opened its doors for the plant employees, responsible for the 24 hour fire protection and physical protection.

Kozloduy NPP Plc. has invested approximately 2 million leva in the building and the equipment inside, which is a token of the attention paid by the plant to the people responsible for its physical safety. The provision of the optimal conditions required for the specific job of fire fighters and policemen guarantees their timely and proper response when needed.

The regional governor ordered in December setting up a special controlled access zone for people, transportation vehicles, agrarian and other vehicles around Kozloduy NPP Plc. This measure had been prescribed in a Government Decree already in 1993 but due to various reasons it was not implemented until December last year. Permanent checkpoints are located at the boundary area.

Presently the implementation of a procedure for construction of new guarded parking lots for the plant employees and visitors is under way. Along the plant road to the south of the plant will be put fences with automatic barriers for the passing vehicles.

The access to all buildings outside the protected area - the three administration buildings of the company, the Information Center and the Training Center has been controlled in the same way /automatic system and pass control point). The automatic access system is being enlarged.

Reconstructions and modernisation

The "Reconstructions and modernisation" division activities in 2000 were focused on the implementation of the Investment program of Kozloduy NPP Plc.

Special attention was paid to the organisation relating to implementation of activities on "V-209 M Project", the Modernization Program for Units 5 and 6, the Program for physical protection upgrading at Kozloduy NPP Plc., construction of buildings related to nuclear waste management.

The activities throughout the year were performed in the framework of the Investment Program' 2000. The draft revision of the program was developed by "PMG - AEI" Kozloduy and approved by NEC Ltd., Sofia. The program amounted to 320 983 000 leva, 81 500 000 leva out of which were company own resources.

After the plant was set up as an independent company on April 30, 2000 and "AEI" became part of Kozloduy NPP Plc. the newly established "Reconstruction and Modernization" division developed an updated investment program for the period of 01 May - 30 December 2000. At that the investment parameters and costs were kept unchanged.

Status of measures relating to Units 1-4

In 2000 the activities on 37 items of the Complex PRG'97/A Modernization Program were progressing. All planned measures were implemented within the unit outages. This allowed the units to have the required higher level of safety when they were restarted after the outage. The implementation of all other planned measures is under way.

The major measures which are characteristic of the next modernization stage have already started, namely: installation of a jet vortex condenser, development of a rest life time management program, revision of the reactor mode tables, analysis of the accident scenarios with Dy 200 and Dy 500 breaks, development of SAR calculation of the spent fuel pond racks, replacement of the automatic step-up loading systems at Units 1-4, implementation of new digital systems for the SG level monitoring at Units 3 and 4 etc.

The safety upgrading measures for Unit 3 and 4 were separated in an independent package based on PRG'97/A. Its purpose is to implement the necessary measures, to make an analysis and modification of the engineering documentation in order to change the design basis of the units into a new reactor model - VVER-440/V-209M and demonstrate the compliance of the new design with the up-to-date safety requirements. The design was approved by the Safety Council of Units 1 - 4 and the company Safety and Quality Council.

Forty measures out of the total 62 measures were at different stages of their implementation by the moment this project was set up. The total cost of the project implementation is estimated at 66 165 000 USD and the funds are provided entirely within the framework of the Investment program of Kozloduy NPP Plc. The company will use all possible sources of external financing.

The activities on all units were highly estimated by an IAEA mission held to evaluate the program.

Activities on Units 5 and 6

The phase preparing the development of the modernization projects ended in 2000.

The purpose of the basic engineering phase was to develop technical projects for the hardware measures and studies, which will be used as a basis for the decisions to be made in the next phase beginning in 2001, when the implementation of the Modernization program itself is to start.

The conditions of the contracts with ECK and Westinghouse were updated. The technical scope of measures was optimized and on this basis started the implementation of the priority measures of both contractors.

In order to provide the necessary financial support Loan agreements were signed with City Bank USA, Euratom and Roseximbank. The overall financing of the project is complemented with plant own funds.

The remaining part of the program is carried out by using company own resources. The replacement of boronmeters and superheaters has been completed. The reliable power supply equipment of the safety systems is being replaced on schedule. This measure will be completed in 2001.

The implementation of the program was reviewed by two missions of the International Atomic Energy Agency. The IAEA experts expressed their high opinion of the current state and plans for future activities.

Overall results of the implementation of Investment Program' 2000

As of 31 December 2000 a total of 80 093 000 leva was spent for long-term assets in 2000 at Kozloduy NPP Plc.

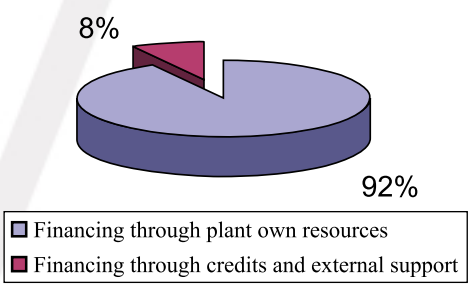
A very good implementation rate (90%) was reached in terms of the investments planned to be implemented with company own resources, while the use of funds coming through assistance and loans was insignificant /2.7%/.

The effective use of loans for the Modernization program of Units 5 and 6 is scheduled to start in the beginning of 2001.

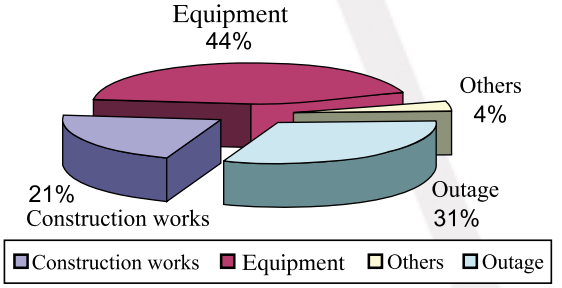
The following table and diagrams to it show the structure of the funds spent for long-term assets in 2000 by sources of financing and cost types:

Source of financing	Investments implemented in 2000	For:			
		Construction works	Equipment	Others	Outage
Total for Kozloduy NPP Plc.	**80 093**	**16 970**	**35 189**	**3 078**	**24 856**
Financing with plant own resources	73 645	10 547	35 189	3 078	24 831
Financing through loans and external support	6 448	6 423	0	0	25

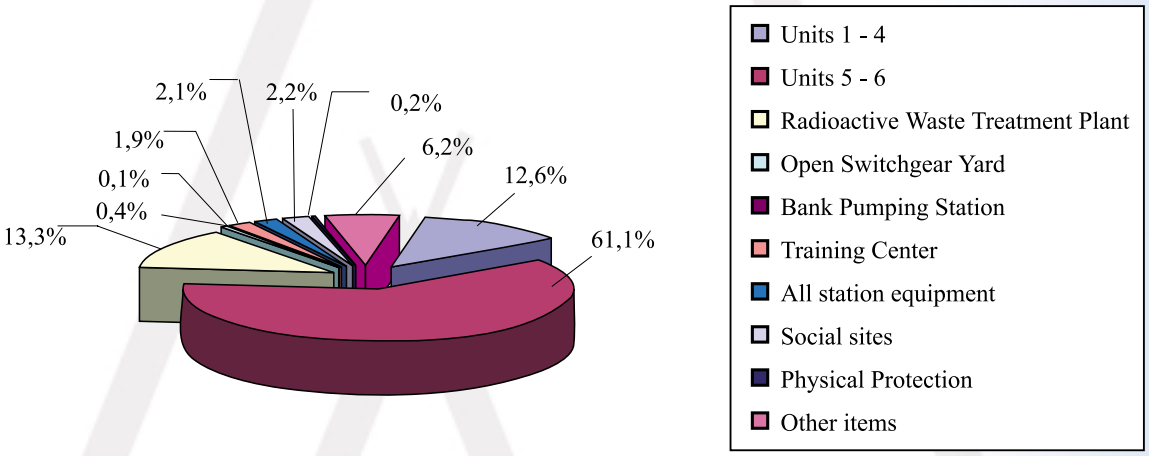
Structure by source of financing



Costs structure



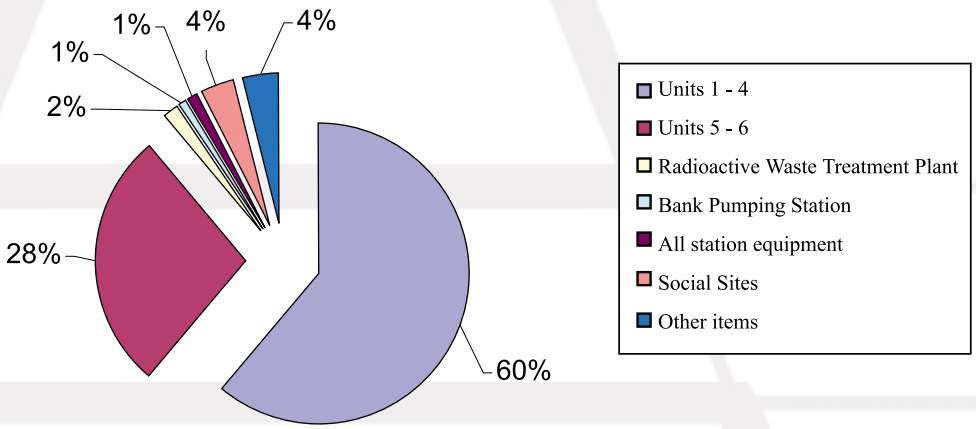
Distribution of the funds spent in 2000 by items compared to their total amount is presented in the drawing:



The following activities of high importance were under way during the above mentioned period:

Replacement of the UPS on the III safety system at Unit 5; Replacement of boronmeters NAR-B at Unit 6; CEFWS 1-4; New External Back-up Power Supply - I stage at Unit 6; new building for the Fire Protection and Police departments; Training Center - II stage; Automated control system (ACS) for the spent fuel storage; ACS for the DG station-2 and Central Pumping Station-2; Nuclear Waste Tretament Plant (NWTP); Waste Treatment Plant storage; Modernisation of superheaters; Reconstruction of the main road to Kozloduy; social sites.

The acceptance and taking over of 36 subitems, including 57 technical decisions, has been certified with a written statement No 16 and statement by the internal acceptance committee. Thirty four subitems at the amount of 52 220 000 leva were completed from accountant's point of view. The following diagram displays the structure of long-term assets of the Investment program.



At the end of the year a written statement No 15 was issued for 7 items at a tentative cost of 69 000 000 leva (the cost of the spent fuel storage included).

The Investment program developed for 2001 amounts to 214 027 000 leva, out of which 83 282 000 leva to be provided from own resources and 130 745 000 leva from loans and assistance. These funds are in line with the needs for intense modernization of Units 3 and 4 and start of the activities on the Main contracts for Units 5 and 6 with ECK and with Westinghouse.

Personnel Training

"We provide the staff with excellent training and qualification in the nuclear technologies field in compliance with the standards for superb quality."

Training of personnel at Kozloduy NPP Plc. is of paramount importance for the safe operation of nuclear units.

Personnel training is based on the Systematic approach to training (SAT) and is carried out by highly qualified specialists of the Training center with the participation and in close cooperation with the managers and specialists of the organizational units of Kozloduy NPP Plc., representing the users of recruited staff. In this department work methodologists and instructors in theoretical and practical training, simulator training instructors, quality assurance and organization of training specialists, computer and application software specialists, providing technical support for the activities in accordance with the quality system requirements.

In the year 2000 4400 hours periodical training was carried out for 5000 trainees from the plant, and 2300 hours on the job training was carried out for 14 000 trainees. The Training center organizes all kinds of theoretical, practical and simulator training. Three thousand employees of external organizations received training for license at a total duration of 1300 training hours.

A specific new activity for this department is the use of simulators. It is carried out by the "Simulators" section and in addition to the training of the operational personnel it includes also engineering analyses, verification and validation of operational documents, evaluation and implementation of design modifications. So far the following simulators have been in use for training purposes:

VVER-1000 full scope simulator (FSS)

- The FSS construction work was completed and on February 25, 2000 the simulator was officailly handed over for operation by the contractor GSE Systems. The simulator was licensed on July 28, 2000 by the Bulgarian Regulatory body. The FSS has a full-scale software model and man-machine interface, a replica of the Control Room of Unit VI.
- The simulator modernization program started by implementing the modifications already implemented at the referent Unit VI .
- Periodical training of Units V and VI operators has been carried out.
- The center implements a joint project with USA DOE and PNLL for simulator instructor training on symptom oriented emergency instructions.

VVER-440 Multifunctional simulator

- The center is in process of implementing a two-year program for training of the Units 1-4 operation staff.
- The center implements a joint project with USA DOE and PNLL for simulator instructors training on

symptom oriented emergency instruction.

- Preliminary studies were performed and a decision is to be made on construction of a full scope simulator for WWER-440/230.
- Due to lack of a WWER-440 full scope simulator and in order to compensate the differences with the used full scope simulator in Novovoronezh in Russia, the Training center implemented a large scale program for improvement of the training of Control room 1 - 4 operational staff.

Principle simulator for VVER-1000 reactor type - provided to the Technical University of Sofia for training of nuclear engineering students.

Training of maintenance personnel has improved by extending the availability of equipment, used for practical training. The following projects were completed or they are at different stages of implementation:

1. Project for I&C laboratory furnishing.
2. Project for developing training on a technological circuit.
3. Project for construction of a stand for training on pneumatic control valves.

4. Project for maintenance training center construction.
5. Project for welding training center construction.

The department develops active conference activities, organizes and holds conferences, seminars, working meetings, round tables, discussions and presentations with the participation of Bulgarian and foreign representatives.

"Personnel and Training Centre" department has a well developed system for quality management as part of the overall quality system at Kozloduy NPP Plc. The quality system follows the ISO 9001 model "Quality systems. A model for quality assurance at design/development, production, installation and maintenance" is being developed to the IAEA requirements for application of a systematic approach to training of a nuclear plant personnel.

The application of a well regulated system for training and qualification of the personnel, the training facilities providing conditions for an adequate and effective training and the modern simulator complex ensure high efficiency of the personnel training.

Nuclear Wastes and Spent Fuel Department

Nuclear Wastes and Spent Fuel Department is an organizational unit of Kozloduy NPP Plc. whose activity is related to nuclear waste management as a complex of interrelated targets, principles and actions, regulated and held in accordance with schedules.

The operational activity of Nuclear Wastes and Spent Fuel Department is mainly related to pretreatment, treatment and intermediate storing of solid nuclear wastes - I and II category, generated in the process of operation of Kozloduy NPP.

All solid nuclear wastes generated in 2000 as well as some of the stored untreated I and II category solid nuclear wastes of previous years were treated in compliance with the methods used.

A total of 1223 m^3 compactable solid nuclear wastes and 25.4 t metal nuclear wastes, were compacted by filling them in 210-l drums, after precompacting them by applying 50-t force and subsequent supercompaction of the sealed drum by applying 910 t force.

The average reduction factor of the outcoming nuclear wastes after the final compaction is 7.

As a result of the program for minimization of radioactive wastes applied lately we reached a steady tendency to reduce the overall volume of solid wastes to be stored for a long period of time. Stored solid nuclear wastes I and II category, both treated and untreated, which have been generated so far at Kozloduy NPP are presented at Fig. 1.

In 2000 was developed and approved the "Complex program for RAW management at Kozloduy NPP Plc. No P2.RP-03/1. It is mainly related to the necessary conditions resulting from commissioning of the complex for treatment, conditioning and storage of RAW and relevant to both solid and liquid wastes.

The radioactive waste treatment plant is the only one of its kind in terms of purpose and technology in Eastern Europe. Two process lines are installed in the building for treatment of solid and liquid RAW, as well as laboratory and administrative complexes.

After facing a number of impediments, after being suspended not once, the completion of the RAW treatment plant construction became a priority target of the nuclear power plant management.

The inauguration of the RAW treatment plant with the commissioning of the solid wastes treatment line for model tests will be followed by complex tests in accordance with the approved program and final acceptance of the RAW treatment complex, storage for treated RAW and auxiliary facilities.

The final commissioning of the Complex will allow treatment of the RAW generated in the process of reactors operation. This will go in parallel with treatment of the accumulated up to now amounts of liquid wastes, the prognosis being to complete their treatment within 5 years.

The storage for treated RAW will solve the RAW issue for the next 30 years. Thus, the plant will be in a position to store reliably with no hazard for the environment radioactive wastes, generated in the process of its operation, until the commissioning of a national RAW storage.

All activities relating to the treatment and storage of the solid RAW are done in compliance with the authorizations issued by the Inspectorate on Safe Use of Atomic Energy (ISUAE) and the regulations in force at Kozloduy NPP.

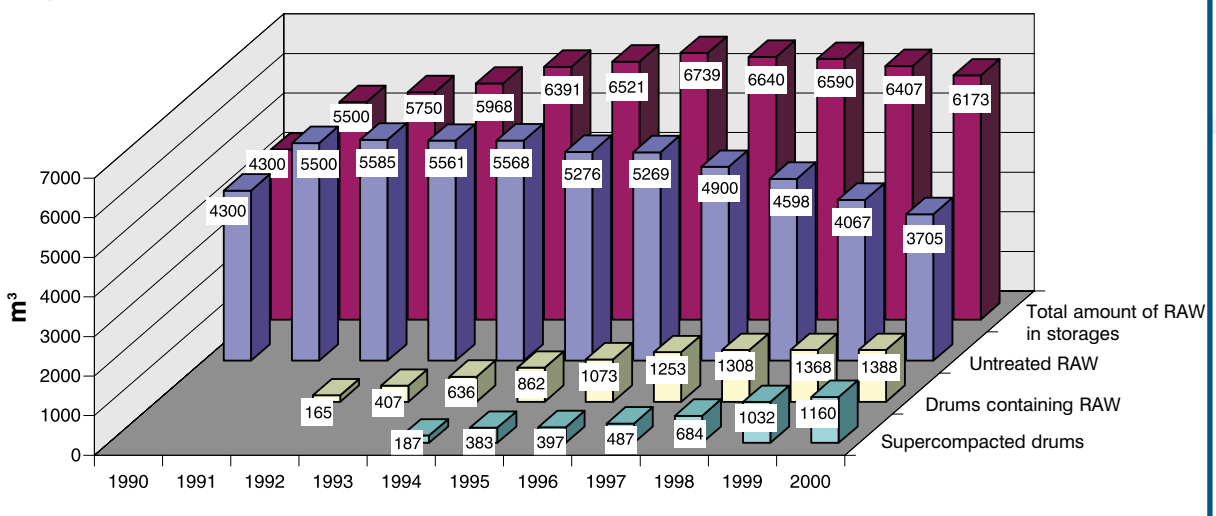
The spent fuel storage has been licensed by the ISUAE of CUAEPP for operation and storage of spent nuclear fuel of VVER-440 and VVER-1000 reactor type units.

A long-term program has been developed for modernization and safety upgrading of the spent fuel storage. This program provides for implementation of a project for compact storage of the spent fuel, which will increase considerably the capacity of the storage.

A tender process for construction of a dry spent nuclear fuel storage is under preparation. This will solve the spent nuclear fuel storage issue for the next 50 years.

Accumulated Untreated Solid RAW I & II category stored by years

Fig. 1



Social policy

Ensuring optimal labour and rest conditions for the personnel is one of the management priorities in terms of company policy. Human factor is of highest importance to the safe plant operation, that is why special care is taken about the job satisfaction of "Kozloduy NPP" Plc. employees, about their physical health and psychological comfort. A number of activities have been carried out in the following areas: psycho - physiological tests, health prophylaxis, labour and living conditions, recreation, internal sociological studies, regular meetings of the management with the personnel.

Motivation and company identification

"Kozloduy NPP" Plc. has been working towards a better social climate and work motivation by:

- optimizing the structure of subdivisions and clearly defining their functions, rights, responsibilities and interrelations;
- specifying the job descriptions and precisely reflecting the actual obligations
- developing a system for a fair remuneration of the personal contribution.

Special rites intended to strengthen the identification of every plant employee with their company have been developed and practiced; the documents, banner and logo of the "Kozloduy NPP" Public Limited Company were sanctified at a special church ceremony; the plant organizes meetings and celebrations of national and company holidays, personal occasions and contributions of the plant personnel.

Labor hygiene, health protection and recreation

Since the autumn of 2000 a licensed labor medicine center has been working on the territory of Kozloduy NPP site. The plant employees can receive competent diagnostic and medical help in this center. Its activities are mainly prophylaxis oriented.

There is a strict initial control of the health status of newly recruited by the plant employees.

The health status of the personnel is good. The temporary labor disability rate of Kozloduy NPP Plc. employees is lower than the one in thermal power plants and the average national rate. The personnel undergoes prophylactic annual medical checks.

Labor hygiene in all structural units of Kozloduy NPP is controlled by a committee and groups for safe and sanitary labor conditions. The plant is one of the founders of the National network of companies enhancing health and safety.

Living conditions

"Kozloduy NPP" Plc. has its own housing fund used by plant employees and their families under preferential conditions. The plant envisions to unfreeze the construction of two more blocks of flats started earlier.

"Kozloduy NPP" Plc. allocates considerable funds for improvement of the social environment in the town of Kozloduy.

The completion of the long lasting construction of a modern swimming complex, comprising indoor and outdoor pools and fitness center, were expedited.

Leisure

The plant personnel and their families enjoy the cultural events, organized by the House of Culture. A music and a ballet schools, foreign language center, amateur theatrical and dance groups and a cinema function here. Conditions allow optimal performance, Kozloduy audience loves its artists, the groups receive a number of invitations to make tours in Bulgaria and abroad.

The sports and tourism club "First Atomic" comprises 16 sections.

"Kozloduy NPP" Plc. got back in 2000 one of its most picturesque recreation facilities - the Gradeshnitsa monastery "Saint John the Baptist".

On 30 September 2000 after rehabilitation the restored monastery was resanctified. In addition, the company banner and logo of Kozloduy NPP Plc. were sanctified at a solemn service.

Mural paintings will soon cover the monastery church, sponsored by donations and by employees' personal financial contributions.

During the vacation and weekends plant employees can rest in the Ledenika recreation complex in the Vratsa mountain and at the Kranevo sea resort.

Enhancement of personnel qualification and motivation is a basic element of Kozloduy NPP Plc. management policy aimed at achieving and maintaining high level of safety culture in accordance with the internationally accepted requirements.

International cooperation

For Kozloduy NPP Plc. 2000 was a year of active and responsible international expert reviews, visits and inspections at which the safety level and the personnel professionalism were highly estimated again.

The International cooperation department gave its contribution to the positive conclusions, assessments and statements in support of the Bulgarian nuclear program, presented at IAEA, WANO and other international institutions by working in the following directions:

• Improvement of Kozloduy NPP Plc. operational experience by providing initiation, organization, protocol and administrative support for important international nuclear forums and activities in Bulgaria, related to our plant cooperation with international institutions and leading nuclear companies;

In 2000 the International Cooperation department was involved in the preparation and holding of 133 events at Kozloduy NPP Plc. (missions, workshops, meetings, presentations, reviews, inspections, training courses, visits and working meetings) in partnership with the State Agency of Energy and Energy Resources, National Electric Company -Plc., Committee on the Use of Atomic Energy for Peaceful Purposes, Bulgarian Academy of Sciences, Energoproject, IAEA, WANO, WONUC, European Consortium, European Union, BNIF and other leading organizations and companies mainly from Russia, USA, France, Germany, Japan, Spain, UK, Austria, Switzerland, Hungary, Finland, Slovak Republic, Check Republic, Sweden.

• Strengthening of Kozloduy NPP Plc. integration with the international nuclear society by development, implementation and analysis of the results of bilateral and multilateral cooperation programs: PHARE, WANO, IAEA, EDF, TECHNATOM etc. More than 250 Kozloduy NPP Plc. specialists were involved in these programs.

• High quality of interpretation services required for bridging the communication gap during missions and visits;

International Cooperation department organized translation of more than 4500 pages, technical documents, urgently needed for the plant operation.

• Building the image of Kozloduy NPP Plc. and Bulgaria as a hospitable member of the international nuclear family of countries with developed nuclear industry by providing protocol services up to the international standards and organizing social programs of the international teams working at the site;

The efforts of the International Cooperation department result in making many plant friends. The department provided logistic support, protocol services and processed the documents of more than 10000 Bulgarian and foreign specialists visiting the plant. The professionalism and sense of responsibility of the staff is proved by the fact that no complaints or conflicts were recorded.

• Contribution to the improvement of qualification of Kozloduy NPP Plc. specialists by :

- Creating and using the possibilities for international scientific and technical exchange through translation and dissemination of professional information;

- Technical assistance in the preparation and participation of the plant specialists in international seminars in Bulgaria and abroad;

- Assistance at the implementation of requalification programs of Control room operators at Novovoronezh NPP simulators.

In 2000 the International Cooperation department kept working and developing successfully the already established functional relations with the different organizational units in order to strengthen the image of the nuclear industry in Bulgaria as a reliable, economically effective and environment friendly branch of the national energy system by developing the scientific and technical relations of the plant with foreign companies and international organizations.

Public Relations

The Information Centre of Kozloduy NPP Plc. celebrated its tenth anniversary. The major task of the center in 2000 as in all previous years was to provide the public with true and timely information about all plant activities, problems and achievements, about continuous improvements related to safe and reliable operation.

Public trust is not easy to gain. If you lose it once, then it is very hard to recover it. Therefore it is very important to provide continuous flow of reliable information. Communication is necessary with both the public and the plant personnel whose trust in the nuclear industry safety helps to make it popular.

Relations with the media are used as a basic means of contacting the public. In 2000 the information center released information about all plant related events on a regular basis.

Eight press conferences on different occasions were organized for the national and regional media representatives. The regular briefings given by the executive manager to the local media journalists became a good tradition.

The Informational Centre was open to all foreign journalists regardless of their attitudes to nuclear industry. Over 47 foreign media representatives were given the chance to familiarize themselves with the plant operation in 2000.

The organized visits to Kozloduy NPP Plc. let people of various age, professions and social groups get a close view of the nuclear plant technology and its safe operation, to meet with people working at the plant. Over 1500 people visited the plant in 2000, 670 of them on the Open Doors Days.

Kozloduy municipality guests from Bulgaria and abroad showed special interest to the Information Centre.

Prominent Bulgarian and foreign politicians visited Kozloduy NPP Plc. in 2000: the President of Republic of Bulgaria Peter Stoyanov, the Minister of Environment and Waters Evdokia Maneva, the Minister of Internal Affairs Emanuil Yordanov, Bulgarian and foreign parliamentarians, ambassadors, members of the European Parliament. The Director General of IAEA-Vienna Mohamed El Baradei also visited the plant.

"First Atomic" is the periodical of Kozloduy NPP Plc. which covers the problems, achievements and perspectives of the plant as well as various aspects of the everyday life of plant employees.

Public Relations Department works closely with the local media.

The "Danube" and "Vizh Kozloduy" weeklies publish regular information about the plant. The local cable TV channel "Telesat" broadcasts every week the program "Nuclear plant bulletin" and the local radio station "Elto" broadcasts plant related information.

Brochures and leaflets of the Informational Center are used as another basic tool to make the nuclear electricity generation and various plant and personnel related activities popular. Leaflets were issued in 2000 for the purposes of the Open Doors Day, the 10th anniversary of the Information Center, the 15th anniversary of the House of Culture, the 1999 annual report of Kozloduy NPP.

The Intranet page of the plant publishes latest information, press reviews, announcements, decisions of the Board of Directors and other miscellaneous information. The plant personnel is able to mail questions and get answers from the company managers.

Regular open meetings of the plant management with the personnel, shown live on the local electronic media, contribute a lot to the good internal communication.

Kozloduy NPP Plc. has a web site at www.kznpp.org.

The international nuclear news agency NucNet receives regular updates about "Kozloduy NPP Plc." and the most interesting NucNet pieces of news are translated and made public through the Internet and the "First Atomic" magazine.

Kozloduy NPP Plc. sponsors a number of events.

The House of Culture is a modern cultural center. Visiting theatrical companies from the National Theatre "Ivan Vasov", the "Barbukov" Theatre, the State Traveling Theatre and others have played on its stage. Famous bands and singers have held concerts. The plant pays for a considerable part of the performances and thus allows free shows for Kozloduy inhabitants.

Kozloduy NPP Plc. sponsored the restoration of the "Saint John the Baptist" monastery in the village of Gradeshnitsa and the museum "Radetzki steamer".

The Public Relations department enlarged its contacts with the media and public in 2000.

To pursue the policy of transparency and openness, to maintain an open dialogue with supporters and adversaries of nuclear industry - that is our motto!

For contacts:
Kozloduy town
Kozloduy NPP Plc.
Information Centre
Tel. 0973 7 2100, 0973 7 2830
Fax: 0973 8 04 39
www.kznpp.org

C O N T E N T S :

KOZLODUY

NPP Plc.

nuclear power plant

2000

For contacts:
Kozloduy town
Kozloduy NPP Plc.
Information Centre
Tel. 0973 7 2100, 0973 7 2830
Fax: 0973 8 04 39
www.kznpp.org